

Module 4

Workstation Configuration Firmware

4.1 OBJECTIVES

Students will be able to:

- Understand Complementary Metal Oxide Semiconductor (CMOS) Configuration
- Utilize configuration files
- Understand the computer basic input/output system (BIOS)

4.2 OVERVIEW

Basic to any personal computer (PC) is the setup of your firmware. In this section, we will examine the CMOS setup for your system, how to configure the CMOS, and determine some of the problems you can run into. Next, we will discuss the AUTOEXEC.BAT and CONFIG.SYS files. When used, these files set the operating parameters for your systems. Lastly, we will gain an understanding of the real importance of the BIOS.

4.3 CMOS CONFIGURATION

The Complementary Metal Oxide Semiconductor chip, commonly referred to as CMOS, stores information about the devices connected to the computer. When you install or change a non-SCSI disk in your computer, you need to use the BIOS setup program provided on your computer to update the information in the CMOS. It is possible for the CMOS battery to run down if you do not turn your computer on for a long time, and the CMOS chip sometimes fails.

4.3.1 CMOS PROBLEMS

The CMOS typically stores information about the following: time and date, floppy disks, video type, hard disks, and the memory installed. Each manufacturer and BIOS vendor can decide what a user should be able to configure, and what the standard configuration is. You can access the CMOS through either a utility program or a keyboard sequence, depending on the manufacturer. You should write down or use a utility program to print all CMOS information.

The computer uses the CMOS checksum to determine if any CMOS values have been changed other than by using the CMOS Setup program. If the checksum is not correct, the computer will not start. Once the CMOS is configured correctly, CMOS problems usually occur because the connection between the CMOS and the battery is loose or faulty; the CMOS has been damaged from static electric discharge; or the time is incorrectly set.

All of these problems may result in information in the CMOS being set to zero, or otherwise corrupt, thus halting the startup.

4.3.2 HARDWARE PROBLEMS

If a device fails to initialize during the power-on self-test (POST), there may be a problem in accessing it. If you have changed or added a device since the last startup, the problem could be with the new configuration. If you have changed your disk configuration, you should check to see if SCSI devices are

terminated properly; ensure the BIOS is enabled on only the first SCSI controller (if at all); and ensure there are no IRQ (interrupt request) conflicts.

If you have not made any changes, check to see that the controller cards are seated properly; the cables are properly connected; and all disks are powered up.

4.4 CONFIGURATION FILES

In Windows 95, Windows 98 and Windows NT, the content and method have changed for handling CONFIG.SYS and AUTOEXEC.BAT files during system startup. Windows 95 and 98 automatically loads drivers and sets defaults by using IO.SYS, the Registry, and other mechanisms rather than using the CONFIG.SYS and AUTOEXEC.BAT files as with previous versions of Windows. However, computers that require certain real-mode drivers or TSRs will continue to require software to be loaded from these two configuration files. Also, the CONFIG.SYS and AUTOEXEC.BAT files may be required to enable certain software options.

4.4.1 AUTOEXEC.BAT

The autoexec.bat file is responsible for telling your computer what it has to do at start-up. It is simply a batch file filled with commands that could be entered from the command prompt. When you power-on or reboot your system, it will automatically look for the autoexec.bat file, and execute the commands within it. If you make any changes to the autoexec.bat file, you must restart the computer for the new entries to be executed.

However, not all computers have an autoexec.bat file. For example, if the computer never had MS-DOS or Windows 3.x installed, it may not have an autoexec.bat file. This file is not required for Windows 95 or 98, but it is included for compatibility purposes. If the computer has an autoexec.bat file, each line is processed in sequence during system startup. Autoexec.bat can contain additional application-specific entries that are run in the sequence listed. Windows 95 and 98 passes the initial environment to COMMAND.COM with the correct Windows and Windows COMMAND directories already in the path and with the environment variables (PROMPT, TMP, and TEMP) already set.

Autoexec.bat commands have equivalent default settings created in IO.SYS for Windows 95 and Windows 98. The command "net start" loads the real-mode network components and validates the binding. Any errors received are placed in the NDISLOG.TXT file. The command "set path" sets the path as specified.

Windows 98 comes with environment configurations already identified in the registry. The default Windows 95 and 98 environment is as follows:

- tmp=c:\windows\temp
- temp=c:\windows\temp
- prompt=\$p\$g
- path=c:\windows;c:\windows\command
- comspec=c:\windows\command\command.com

4.4.1.1 CHANGES FOR WINDOWS 95 AND 98

When Windows 95 or 98 is loaded over an existing operating system that utilizes an autoexec.bat, the Windows 95 and 98 Setup makes the following basic changes to that file:

- Updates the **PATH=** line statement
- Uses **REM** to comment out incompatible TSRs
- Deletes any **win** statement (or equivalent) and SHARE.EXE
- Copies the original AUTOEXEC.BAT to AUTOEXEC.DOS
- Sets the TEMP directory

4.4.1.2 EDITING IN WINDOWS 95 AND WINDOWS 98

If you edit the AUTOEXEC.BAT file, observe the following basic guidelines:

- Do not include other versions of Windows in your path.
- Start the path with C:\WINDOWS;C:\WINDOWS\COMMAND (using the name for the Windows 95 or 98 directory on your hard disk if it is not WINDOWS).
- Windows 95 and Windows 98 Setup leave the previous MS-DOS directory in the path. Do not change this.
- Do not add SMARTDrive or other disk caches. Windows 95 and Windows 98 include built-in caching.
- Do not include any statements for loading mouse support software. Windows 95 and Windows 98 include built-in mouse support.
- If it is necessary to connect to a network server when you start Windows 95 or Windows 98, create a batch file and run it from the STARTUP directory, rather than placing an entry in the AUTOEXEC.BAT file.

4.4.1.3 SAMPLE AUTOEXEC.BAT FILE

```
@ECHO OFF
Setting up sound card
SET BLASTER=A220 I7 D1 H5 P330 T6
SET CTSYN=C:\WINDOWS
C:\PROGRA~1\CREATIVE\SBLIVE\DOSDRV\SBEINIT.COM
REM [Header]
Installing CD drives
REM [CD-ROM Drive]  REM allows to "remark" out statements and to add comments to your files.
C:\WINDOWS\COMMAND\MSCDEX.EXE /D:MSCD001
C:\NETSTART
```

If you don't want a particular line to execute in the autoexec.bat file, you can delete the line or better yet, just remark out the statement. To remark out a statement, put "rem" in front of the statement or a ";" in front. This will cause the operating system to ignore anything on that line past the "rem" or ";". One reason for remarking out the statement is as a troubleshooting tool. If you want to see if a problem lies with one statement, remark it out to see if it resolves the problem. If it does not, you can then remove the rem or ";", versus having to retype them. Another reason for using remark statements is to document the statements.

4.4.2 CONFIG.SYS

The config.sys file, like the autoexec.bat file, is a text file filled with instructions for your computer. The config.sys file mostly contains the drivers for your system, along with the parameters for and location of those drivers. Each time your system boots, it uses the config.sys file to configure those drivers required to operate the components of your computer. Thus, if you install a new component and add a driver to the config.sys file, you must reboot your system for it to recognize that component. Often times, this process is automatically part of the install or setup program. Lastly, unlike the autoexec.bat file, the lines of the config.sys file are not commands that can be executed from the command prompt.

In Windows 95 and Windows 98, the io.sys file, as described in the previous section implements config.sys defaults. However, the config.sys file can contain application-specific entries, in addition to information stored in the io.sys file. These are processed in the sequence they are listed. After the basic config.sys file has been read, all devices are loaded and command.com is running. Windows 95 and Windows 98 loads memory managers supplied by other vendors if they are present in the config.sys file; however, some errors may occur. Similarly, Windows 95 and Windows 98 allows the use of command shells from other vendors, but, for example, long filenames are disabled, which might also indicate that other problems could occur using these command shells.

4.4.2.1 CHANGES FOR WINDOWS 95 AND 98

Windows 95 and Windows 98 have predefined settings, which are built-in for most common config.sys settings. Therefore, the Windows 95 and Windows 98 setup removes many of these lines (such as settings for files, buffers, and stacks), if they are equivalent to the default values, by using REM to comment out the line.

4.4.2.2 EDITING IN WINDOWS 95 AND 98

If you edit CONFIG.SYS in Windows 95 and Windows 98, observe the following basic guidelines:

- Do not include the **smartdrv** command. Windows 95 and Windows 98 include built-in disk-caching, and double-buffering is now provided by DBLBUFF.SYS.
- Remove any **device=mouse.sys** lines or similar lines. Windows 95 and Windows 98 include built-in mouse support.

4.4.2.3 SAMPLE CONFIG.SYS

```
DEVICE=C:\WINDOWS\HIMEM.SYS
DEVICE=C:\WINDOWS\EMM386.EXE
REM [Header]
Setting up the CD ROM drive.
REM [CD-ROM Drive]
DEVICE=C:\CDROM\HIT-DVD.SYS /D:MSCD001
FILES=60
BUFFERS=30
STACKS=9,256
DEVICE=C:\DOS\HIMEM.SYS
```

```
DOS=HIGH
DEVICE=c:\windows\setver.exe
[COMMON]
DEVICE=C:\DELL\RTC.CLK +R
```

Remarking out statements can be used in the same way as it was in autoexec.bat.

4.5 BASIC INPUT/OUTPUT SYSTEM (BIOS)

A computer needs a software program to work. It even needs a simple program just to turn itself on and be able to load software. The Basic Input/Output System (BIOS) of a computer is a set of permanently recorded program routines that give the system its fundamental operational characteristics, including instructions telling the computer how to test itself every time it is turned on. Using today's plug-and-play technology, the BIOS cooperates with your operating system to configure all the peripherals you plug into your PC. The operating system then replaces most of the BIOS code with its own software. In other words, after the BIOS boots and tests your PC, it steps out of the way so that your software can get the real work done.

The BIOS is the central nervous system for your computer. The BIOS works in the background to determine how the information is moved in and out of diskettes, keyboards or memory. The BIOS, itself, is code-written into ROM or EPROM chips on the motherboard. Periodically, the BIOS is upgraded to handle newer products. Depending on the type of chip you have, you can sometimes perform a software upgrade, as opposed to replacing the chip or motherboard.

4.5.1 EXPLANATION OF BIOS ROM SHADOWING

The term "shadowing" refers to the technique of copying BIOS code from slow ROM chips into faster RAM chips during boot-up so that any access to a BIOS routine will be faster. DOS and other operating systems may access BIOS routines frequently. System performance is greatly improved if the BIOS is accessed from RAM, rather than from a slower ROM chip.

On an older motherboard, the BIOS will reside in one, two or four EPROM chips. On a newer motherboard, the BIOS will probably be kept in a flash chip. In either case, the chip is accessed 8 bits at a time, while RAM on a 486 or 386DX system is accessed 32 bits at a time. In addition, the access time of ROM chips is slower - 150ns to 200ns for ROM compared to 60ns or 70ns for RAM.

The 64KB memory range F000-FFFF is reserved for the ROM BIOS. The ROM chip is accessed at this address. The same address range exists in RAM, as well. If shadowing is enabled (in some systems a CMOS setup option; in others not optional), the BIOS is copied from the ROM chip into the same location in RAM during its boot-up process. System BIOS shadowing should be enabled normally on all PCs.

There is usually an option in the CMOS setup to enable video BIOS shadowing. The video BIOS is normally in ROM chips on the video card. On motherboards with built-in video, the video BIOS may be in the same 128K chip as the system BIOS (and may be addressed at E000). The video BIOS is usually addressed at C000-C7FF. If video BIOS shadowing is enabled, the system BIOS will copy the video BIOS to RAM at C000-C7FF during its boot-up process. Normally, video BIOS shadowing would be enabled on all PCs.

The BIOS may also allow for shadowing other ROMs, such as on a network card. These ROMs would normally be located in the upper memory area in the range between C800 and EFFF.

4.5.2 UPGRADING BIOS

As previously mentioned, upgrading your BIOS is dependent upon which type of BIOS is installed in your system. Their older systems have all components soldered directly to the motherboard. Other systems have the BIOS ROM chip or chips in removable sockets. With these, it is a matter of finding an upgraded chip, removing the old chip, and inserting the new one. Lastly, some systems can be upgraded by simply running a software routine. Be sure to consult your manufacturer's product manual before attempting an upgrade.

Most of today's systems come with BIOS that can be updated through software. This is called Flash Bios. It is a piece of software that you use to upgrade the BIOS. The process is called "Flashing the BIOS". You can usually download BIOS upgrades from the manufacturer's site on the Internet.

4.6 SUMMARY

In this module, we explained the CMOS setup for your system, showed you how to configure it, and described a few potential problems you could encounter. Our discussion covered the AUTOEXEC.BAT and CONFIG.SYS files, and how they may set the operating parameters for your system. Finally, we stressed the importance of the BIOS.

4.7 REVIEW QUESTIONS

1. What computer chip stores information about the devices connected to the computer?

2. Which file contains the drivers for your system, along with the parameters for and location of those drivers?

3. Which file tells your computer what it has to do at start up?

4. What computer chip is used to determine how the information is moved in and out of diskettes, keyboards, or memory?